M22

# GSM / GPRS Wireless Module

DATASHEET

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**BenQ Corp.**

**Networking & Communications BG**

18 JiHu Road, Nei-Hu, Taipei 114, Taiwan, R.O.C.

Tel: +886-2-2799-8800

Fax: +886-2-2799-8332

http://www.benq.com

# HISTORY

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|---|---|---|
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# 1. INTRODUCTION

## 1.1. DESCRIPTION

**Overview**

The document describes all the functions, features, and interfaces of the GSM/GPRS Tri band Module M22 from BenQ. The M22 GSM/GPRS module can provide wireless communication solution for any product that has requirement of voice communication and data transmission through state of the art cellular technology.

With the BENQ M22 GSM/GPRS module, devices are enhanced in both functionality and usability based on state of the art wireless technology.

## 1.2. APPLICATION DEVICE

This module is designed to satisfy manufacturers, which also have a physical dimension concern of embedded GSM/GPRS features built into their products. Some main application devices of this module are:

- Wireless PSTN
- Mobile Trunk
- Car Phone/Telemetric
- Wireless Terminal
- Alarm/Securities System
- Remote control

## 2. Features

### 2.1. General Characteristics

- BAND: EGSM 900/DCS 1800/PCS 1900 MHZ

| | TX | RX |
|---|---|---|
| EGSM | 880~915 MHz | 925~960MHz |
| DCS | 1710~1785MHz | 1805~1880MHz |
| PCS | 1850~1910MHz | 1930~1990MHz |

- GSM/GPRS: Phase 2+ Compliance
  - i. GPRS Class 4: Max 3 downlink, 1 uplink, max 4 slot
  - ii. GPRS Class B:

    Simultaneous

    - attach
    - activation
    - monitor
    - no simultaneous traffic.
  - i. Coding Scheme:
    - CS1 - 9.05 kbps
    - CS2 - 13.4 kbps
    - CS3 - 15.6 kbps
    - CS4 - 21.4 kbps
- Support SIM Interface: 3V
- Form factor
  - i. Dimension: 55.5 x 40 x 5.95 mm
  - ii. Weight: 13 g
- Power

  Operation Voltage: 3.2V – 4.2V
- Power Consumption:

  Speech Mode: 230 mA (min), 260 mA (max)

  Standby Mode: < 6 mA (paging rate 2),< 3 mA (paging rate 9) at GSM 900Mhz

  GPRS : 250 mA (max)
- Hardware Output:

  44 Pins female connector interface.
  - UART/RS232 RS232 transmit interface
  - UART 2 Software Debug
  - BU Buzzer Output
  - GPIO General Purpose I/O
  - Power On Power On Pin
  - LED Driver LED Driver, Paging

- SIM SIM Function
- VBAT Battery Voltage Input
- Audio Earphone/MIC/Hand free
- Keypad Interrupt Keypad Interrupt
- BGND GND
- ANT Antenna

- Software Interface:

**GSM Rec. 27.07**

- General
- Call Control
- Network Service
- ME Control and Status
- ME Errors
- TIA IS-101

**GSM Rec. 27.05**

- SMS related services
- General Configuration
- Message Configuration
- Message Receiving and Reading
- Message Sending and Writing

**ITU-T Rec. V25ter**

- General TA Control
- Call Control and Command Response
- Data Compression

**ITU-T Rec. T.32**

- Action Command
- DCE Response
- Service Command

**Note: For software AT commands, please refer to the M22 AT Command List.**

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## 2.2. Voice/Data Service

**Tele Service**

- Speech Service With EFR (Enhance Full Rate)/FR (Full Rate)/HR (Half Rate) Codec.
- Emergency Call
- DTMF Tone Generation

**Short Message Service**

- SMS with MT (Mobile Terminate)/PP, MO (Mobile Originated)/PP
- Delivery Report
- Cell Broadcast

**FAX Service**

- Direction: MOC (Mobile originated call) & MTC (Mobile terminated call)
- Fax GSM TS 3.45 fax transparent mode
- TS 61, 62
- TIA/EIA 578, Fax class 1, Interface to PC for GSM & PSTN
- TIA/EIA 592, Fax class 2, Interface to PC for PSTN
- ITU-T V.17 (14400 bps), V29 (9600bps), V27ter (2400/4800 bps)
- Transmission speed rate: 2400, 4800, 7200, 9600bps

**Circuit Switch**

- Data GSM TS 4.21 transparent mode
- Data GSM TS4.22 transparent mode
- Data transmission mode: asynchronous (normal)
- Radio channel: full rate
- Transmission speed rate: 2400, 4800, 9600 bps with data compression max 14400bps

**Packet Switch**

- GPRS Class B device
- Multi-Slot Transmission up to Class 4, 1 uplink slot, 3 downlink slot
- Coding Scheme CS1 – CS4 Supported

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## 2.3. Supplementary Service

**Number identification**

- Calling line identification presentation (CLIP)
- Calling line identification restriction (CLIR)
- Connected line identification presentation (CoLP)
- Connected line identification restriction (CoLR)

**Call Offering**

- Call forwarding unconditional (CFU)
- Call forwarding on mobile subscriber busy (CFB)
- Call forwarding on no reply (CFNRy)
- Call forwarding on mobile subscriber not reachable (CFNRc)

**Call Completion**

- Call waiting (CW)
- Call hold (HOLD)

**Multi-Party**

- MPTY Supported

**Call-barring**

1. Barring of all outgoing calls (BAOC)
2. Barring of outgoing international calls (BOIC)
3. Barring of outgoing international calls (BOIC- xHC)
4. Barring of all incoming calls (BAIC)
5. Barring of incoming calls when roaming (BIC-Roam)

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## 2.4. RF Functionalities

### Maximum TX Power

The performance of the transmitter meets test requirement GSM 11.10 Chapter 13.

| Band | Max | Min |
|---|---|---|
| EGSM | 33 dBm ±2dBm | 5 dBm ±5dBm |
| DCS | 30 dBm ±2dBm | 0 dBm ±5dBm |
| PCS | 30 dBm ±2dBm | 0 dBm ±5dBm |

### Parametric Performance

Tests carried out at -20ºC, 25ºC and 60ºC for each voltage 3.6V, 3.8V and 4.0V. The Measure Peak Phase, RMS Phase, frequency error, power level, and static sensitivity meets GSM 11.10 specifications

| Band | Peak Phase Error | RMS Phase Error |
|---|---|---|
| EGSM | <20 ° | <5 ° |
| DCS | <20 ° | <5 ° |
| PCS | <20 ° | <5 ° |

### Sensitivity

The performance of the receiver meets test requirement GSM 11.10 Chapter 14.

| Band | Typical | Min |
|---|---|---|
| EGSM | -106 dBm | -104 dBm |
| DCS | -105 dBm | -103 dBm |
| PCS | -105 dBm | -103 dBm |

### Radio Frequency

| | |
|---|---|
| **Radio Frequency (900 MHz EGSM)** | |
| Frequency Range | TX 880-915 MHz; RX 925-960 MHz |
| Channel Spacing | 200 KHz |
| Number of Channels | 124 Carriers x 8 (TDMA) |
| Modulation | GMSK |
| Duplex Spacing | 45 MHz |
| Frequency Stability | +/- 0.1 ppm (Uplink TX) |
| Power Output | 33 dBm Class 4 (2 W peak) |
| Output Impedance | 50 Ohm |
| Spurious Emission | -36 dBm up to 1 GHz (< -30 dBm > 1 GHz) |
| **Radio Frequency (1800 MHz)** | |
| Frequency Range | TX 1710-1785 MHz; RX 1805-1880 MHz |
| Channel Spacing | 200 KHz |
| Number of Channels | 374 Carriers x 8 (TDMA) |
| Modulation | GMSK |
| Duplex Spacing | 95 MHz |
| Frequency Stability | +/- 0.1 ppm (Uplink TX) |
| Power Output | 30 dBm – 0 dBm |
| Output Impedance | 50 Ohm |
| Spurious Emission | -36 dBm up to 1 GHz (< -30 dBm > 1 GHz)<br>Compatible with phase 2 feature |
| **Radio Frequency (1900 MHz)** | |
| Frequency Range | TX: 1850~1910MHz; RX: 1930~1990MHz |
| Channel Spacing | 200KHz |
| Number of Channels | 299 Carriers x 8 (TDMA) |
| Modulation | GMSK |
| Duplex Spacing | 80 MHz |
| Frequency Stability | +/- 0.1 ppm (Uplink TX) |
| Power Output | 30 dBm – 0 dBm |
| Output Impedance | 50 Ohm |
| Spurious Emission | -36 dBm up to 1 GHz (< -30 dBm > 1 GHz)<br>Compatible with phase 2 feature |

# 3. Hardware Description

## 3.1. INTERFACE

The function description of the M22 module is illustrated as the following table. The pins of the M22 module support functions like UART, GPIO, AUDIO, SIM … etc. These features can meet customer design requirement for Car Phone.

44 Pins female connector interface

| Group | Pin no. | Description |
|---|---|---|
| UART/RS232 | 6 | RS232 transmit Interface |
| UART2 | 2 | Software Debug |
| BU | 1 | Buzzer Output |
| GPIO | 6 | General Purpose I/O |
| Power On | 1 | Power On Pin |
| LED Driver | 1 | LED Driver, Paging |
| SIM | 4 | SIM Function |
| VBATRF | 3 | Power input for RF |
| VBATBB | 1 | Power input for BB |
| Audio | 7 | Earphone/MIC/Hand Free |
| Keypad Interrupt | 1 | Keypad Interrupt |
| BGND | 10 | GND |
| NC | 1 | NC |

Antenna interface (MMCX connector)

| Group | Pin no. | Description |
|---|---|---|
| ANT | 1 | Antenna interface |

Detailed Pin descriptions and electrical characteristics will be given in the upcoming contents.

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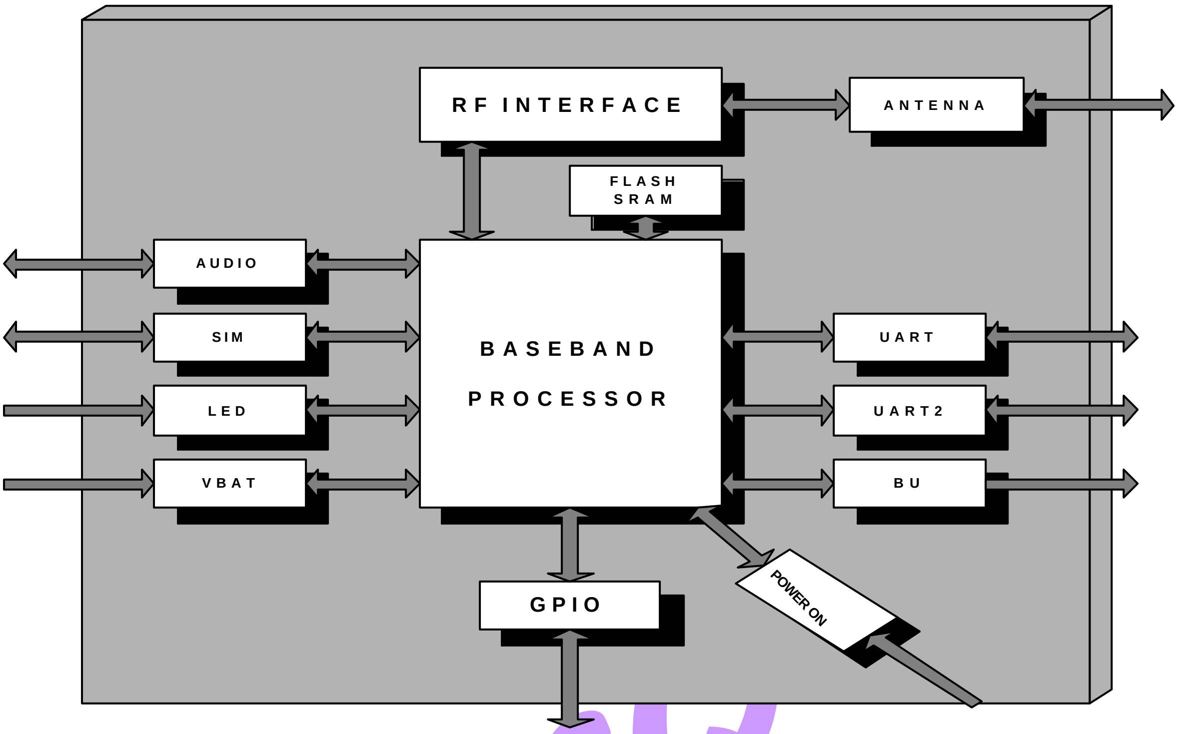
### 3.2. Functional Diagram

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## 3.3. Pin Description

### Description Table

| Pin | Description | I/O | PU | Reset | Config |
|---|---|---|---|---|---|
| BGND | Ground | | | | |
| IO 10 | M22 wake up External device | O | | Input | Output / 0 |
| ROW4 | Keypad Interrupt (Ext. device wake up of M22) | I | PU | Input | Input |
| PWON | Power On | I | PU | Input | Input |
| TXD2 | UART2-Transmit Data | O | | Output / 1 | 1 |
| RXD2 | UART2-Receive Data | I | PU | Input | Input |
| BU | Buzzer Output | O | | 0 | 0 |
| IO 12 / DCD | GPIO 12 | O | | Input | Output / 0 |
| VBATRF | RF PA Power Voltage Input | **Power** | | | min / typ / max: 3.3 / 3.6 / 5.0 V |
| TXD | UART1-Transmit Data | O | | Output / 1 | 1 |
| RXD | UART1-Receive Data | I | PU | Input | Input |
| RTS | UART1-Request To Send | O | | Output / 1 | 1 |
| CTS | UART1-Clear To Send | I | PD | Input | Input |
| DSR | UART1-Data Set Ready | I | PU | Input | Input |
| IO8/DTR | GPIO 8/ Data Terminal Ready | O | | 1 | Output / 0 |
| TDI | JTAG-Data Input | I | LPU | Input | Input |
| IO 13 | GPIO 13 | I | | Output / 1 | Input |
| IO1 / RI | GPIO 1 | O | | Input | Output / 0 |
| IO 6 | Re-download Data path and audio path switch | O | | Input | Output / 1 |
| IO 11 | Power off mode switch control signal to open or link the connection between system (Host) and module (client).<br>*Low :; Connect*<br>*High: Disconnect*<br>*Default = **Connect ( Low )*** | O | | Input | Output / 0 |
| AUXI | Auxiliary hands free amplifier negative input(-) | I | | | Input |
| MICIN | Microphone amplifier negative input(-) | I | | | Input |
| MICIP | Microphone amplifier positive input(+) | I | | | Input |
| MICBIAS | Microphone bias supply | power | | | Output(2v/2.5v) |
| EARP | Earphone amplifier positive output(+) | O | | | Output |
| EARN | Earphone amplifier negative output(-) | O | | | Output |
| AUXOP | Auxiliary hands free amplifier positive Output(+) | O | | | Output |
| SIM_RST | SIM Reset | O | | 0 | Output |
| SIM_IO | SIM Input / Output | I/O | | 0 | Input / Output |
| SIM_CLK | SIM Clock | O | | 0 | Output |
| VRSIM | Regulator SIM Output | O | | | Output |
| LEDA | LED Driver, Paging Indicator | I | | | Input |
| VBATBB | System Power Voltage Input | **Power** | | | min / typ / max: 3.3 / 3.6 / 4.5 V |

### UART/RS232

The UART includes the following additional features

- Hardware flow control (DSR, RTS/CTS)
- Auto-baud rate with the possibility of baud-rates ranging from 1200 to 115.2K bits.

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| TXD | 34 | | 1 | Output/1 | Transmit Data |
| RXD | 33 | PU | Input | Input | Receive Data |
| RTS | 32 | | Output / 1 | Output/1 | Request to Send |
| CTS | 31 | PD | Input | Input | Clear to Send |
| DSR | 30 | PU | Input | Input | Data Set Ready |
| IO 8/DTR | 29 | | 1 | Output/1 | Data Terminal Ready |

Note: The difference between Reset and Config is in the pin definition table

Pin IO 1 / IO 12 / IO 8 is dedicated to UART functions.

**UART 2**

Used for software debug.

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| TXD2 | 8 | | 1 | Output/1 | Transmit Data |
| RXD2 | 37 | PU | Input | Input | Receive Data |

**BU**

When there is an incoming call, the Buzzer will generate a pulse.

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| BU | 36 | | 0 | Output/0 | Buzzer Output Pin |

**GPIO**

The module provides 6 GPIO pins configurable in read or write mode.

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| IO 10 | 39 | | Input | Output/0 | Module wake up external device |
| IO 13 | 28 | | 1 | Input | GPIO13 |
| IO 6 | 25 | | Input | Output/1 | Re-download data path and audio path switch |
| IO 11 | 27 | | Input | Output / 0 | M22 Power off, connection between M22 and system (Host) open or short switch signal |
| IO 12/ DCD | 9 | | Input | Output/0 | GPIO12/Data Carrier Detect |
| IO 1/ RI | 24 | | Input | Output/0 | GPIO1/Ring Indicator |

Note: 1) IO 10 timing sequence is defined in design guide.

2) IO 1 and IO 12 dedicate for UART feature (RI / DCD).

**LED Driver**

LEDA is dedicated for paging identification.

The initial status is listed as follows:

i. In the initial mode (no voltage input), this pin will be in HIGH status.

ii. In standby mode it will be pulled low for **500 ms** and then pulled high for **500 ms**, alternately.

iii. In active mode (Incoming call) it will be pulled low **125 ms** and pull high **125 ms**.

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| LEDA | 6 | | | Input | LED DRIVER, paging Indicator |

Note: 1) The maximum current is 10 mA.

2) The LEDA voltage range is 0.4 V ~ VBATBB

**SIM Function**

The SIM Card digital interface in ABB insures the translation of logic levels between DBB and SIM Card for the transmission of 3 different signals: a clock signal, derived from a clock elaborated in DBB, to SIM Card (SIM_CLK); a reset signal, from DBB to the SIM Card (SIM_RST); and serial data from DBB to SIM Card (SIM_IO) and vice-versa.

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| SIM_CLK | 11 | | 0 | Output | SIM Clock |
| SIM_RST | 13 | | 0 | Output | SIM Reset |
| SIM_IO | 12 | | 0 | Input /Output | SIM Input / Output |
| VRSIM (3V) | 23 | | | Output | Regulator SIM Output |

**VBAT**

The maximum and minimum voltage will be defined in the Electrical Characteristics Table.

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| VBATRF | 41 | | | Input | RF PA Power Voltage input |
| VBATRF | 42 | | | Input | RF PA Power Voltage input |
| VBATRF | 43 | | | Input | RF PA Power Voltage input |
| VBATBB | 1 | | | Input | System Power Voltage input |

**Audio Function**

There is a choice of differential EAR Phone output and differential Microphone input depending on customers' use. In addition, auxiliary pins can be used for hands-free.

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| EARP | 20 | | | Output | Earphone amplifier positive output(+) |
| EARN | 21 | | | Output | Earphone amplifier negative output(-) |
| MICP | 16 | | | Input | Microphone amplifier positive input(+) |
| MICN | 17 | | | Input | Microphone amplifier negative input(-) |
| AUXOP | 22 | | | Output | Auxiliary hands free amplifier positive output(+) |
| AUXI | 18 | | | Input | Auxiliary hands free amplifier negative input(-) |
| MICBIAS | 15 | | | Output | Microphone bias supply |

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**BGND**

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| BGND | 2 | | | | GND |
| BGND | 3 | | | | GND |
| BGND | 4 | | | | GND |
| BGND | 5 | | | | GND |
| BGND | 10 | | | | GND |
| BGND | 19 | | | | GND |
| BGND | 26 | | | | GND |
| BGND | 35 | | | | GND |
| BGND | 40 | | | | GND |
| BGND | 44 | | | | GND |

**Interrupt**

For dual processor use, an interrupt signal from the external processor can be sent to the module when needed.

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| IO10 | 39 | | Input | Output/0 | Module wakes up host system |
| ROW 4 | 7 | **PU** | Input | Input | External Device interrupt M22 |

Note: Detailed interrupt sequences between the host and module is given in the M22 design guide.

### Power ON

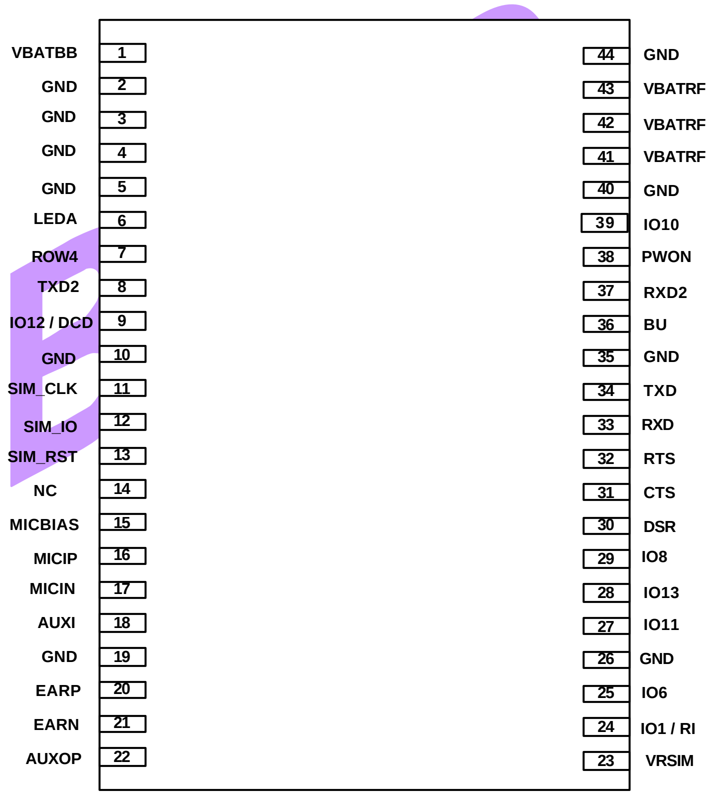
The Power On Pin needs to be pulled low for at least **120ms** to operate

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| PWON | 38 | **PU** | | Input | Power On |

### Antenna

| Pin Name | Pin Out | Pull | Reset | Config | Description |
|---|---|---|---|---|---|
| Ant | MMCX connector | | | | Antenna interface (50 Ohm) |

## 3.4. M22 Terminal Definition



### 3.5. Electrical Characteristics

| Pin | Function /Name | Description | PARAMETER | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| 2 | GND | Ground | | | | | | |
| 1 | VBATBB | System power input | | | 3.3 | 3.6 | 4.5 | V |
| 6 | LEDA | LED driver, paging | DIGOUT | Current | | | 10 | mA |
| | | | | Supply voltage | | | VBATBB | V |
| 23 | VRSIM | Regulator SIM output | Active mode | | | | 10 | mA |
| | | | Sleep mode | | | | 1 | mA |
| | | | SIMSEL='0' | | 1.65 | 1.8 | 1.95 | V |
| | | | SIMSEL='1' (Default) | | 2.7 | 2.85 | 3 | V |
| 11 | SIM_CLK | SIM_clock | CLKOUT | | 1M/3v | | 5M/3V | Hz/V |
| | | | | (Voh) | 0.7*VRSIM | | | V |
| | | | | (Vol) | | | 0.2*VRSIM | V |
| | | | | Rated Current | | 2 | | mA |
| 13 | SIM_RST | SIM _reset | DIGOUT | (Voh) | 0.7*VRSIM | | | V |
| | | | | (Vol) | | | 0.2*VRSIM | |
| | | | | Rated Current | | 2 | | mA |
| | | | | (Vol) | | | 0.4 | V |
| | | | | Rated Current | | 2 | | mA |
| 10 | GND | Ground | | | | | | |
| 22 | AUXOP | Auxiliary hands free amplifier output(+) | Min. output resistive load | Min. output resistive load | 1 | 1.2 | | Kohms |
| | | | | Max. output capacitive load | | | 100 | pF |
| | | | | Common mode min. resistive load at AUXOP or AUXON | | 200k | | Ohms |
| | | | | Common mode max. capacitive load at AUXOP or AUXON | | | 10 | pF |
| 19 | GND | Ground | | | | | | |
| 21 | EARN | Earphone amplifier output(-) | 1.5 Vpp/Output swing 3.9 Vpp | | | 33/120 | | ohms |
| 20 | EARP | Earphone amplifier output(+) | 1.5 Vpp/Output swing 3.9 Vpp | | | 33/120 | | ohms |
| 15 | MICBIAS | Microphone bias supply | DC-Power | MICBIAS=0 | | 2 | | V |
| | | | | MICBIAS=1 | | 2.5 | | V |
| 16 | MICIP | Microphone amplifier input(+) | | | | 32.5 | | mVrms |
| 17 | MICIN | Microphone amplifier input(-) | Nominal Ref. Level (MICIP-MICIN) | | | -10 | | dBm0 |
| | | | Differential input resistance (MICIP-MICIN) | | | 100 | | dBm0 |
| 18 | AUXI | Auxiliary microphone amplifier input: single ended | | | | 365 | | mVrms |
| 3 | GND | Ground | | | | | | |
| 27 | IO11 | GPIO:Input/Output11 | DIGOUT | (Voh) | 2.24 | | | V |
| | | | | (Vol) | | | 0.616 | V |
| | | | | Rated current | | 2 | | mA |
| 25 | IO 6 | GPIO: Input/Output 6 | DIGOUT | (Voh) | 2.24 | | | V |
| | | | | (Vol) | | | 0.616 | V |
| | | | | Rated current | | 2 | | mA |
| 24 | IO 1/RI | GPIO: Input/Output 1 | DIGOUT | (Voh) | 2.24 | | | V |
| | | | | (Vol) | | | 0.616 | V |
| | | | | Rated current | | 2mA | | |

| Pin | Function /Name | Description | PARAMETER | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| 26 | GND | Ground | | | | | | |
| 4 | GND | Ground | | | | | | |
| 28 | IO13 | GPIO:Input/Output13 | DIGIN/OUT | (Vih) | 1.96 | | 3.3 | V |
| | | | | (Vil) | -0.5 | | 0.84 | |
| 29 | IO 8/DTR | Data Terminal Ready | DIGOUT | (Voh) | 2.24 | | | V |
| | | | | (Vol) | | | 0.616 | V |
| | | | | Rated current | | 2 | | mA |
| 30 | DSR | RS232: Data set ready | DIGIN | (Vih) | 1.96 | | 3.3 | V |
| | | | | (Vil) | -0.5 | | 0.84 | |
| 31 | CTS | RS232: Clear to send | DIGIN | (Vih) | 1.96 | | 3.3 | V |
| | | | | (Vil) | -0.5 | | 0.84 | |
| 32 | RTS | RS232: request to send | DIGOUT | (Voh) | 2.24 | | | V |
| | | | | (Vol) | | | 0.616 | |
| | | | | Rated current | | 4 | | mA |
| 33 | RXD | RS232: receive data | DIGIN | (Vih) | 1.96 | | 3.3 | V |
| | | | | (Vil) | -0.5 | | 0.84 | |
| | | | | Rated current | | 1 | | mA |
| 34 | TXD | RS232: transmit data | DIGOUT | (Voh) | 2.24 | | | V |
| | | | | (Vol) | | | 0.616 | |
| | | | | Rated current | | 4 | | mA |
| 35 | GND | Ground | | | | | | |
| 41 | VBATRF | Battery voltage input | | | 3.3 | 3.6 | 5.0 | V |
| 42 | VBATRF | Battery voltage input | | | 3.3 | 3.6 | 5.0 | |
| 43 | VBATRF | Battery voltage input | | | 3.3 | 3.6 | 5.0 | |
| 40 | GND | Ground | | | | | | |
| 44 | GND | Ground | | | | | | |
| 9 | IO12 / DCD | GPIO:Input/Output12 | DIGOUT | (Voh) | 2.24 | | | V |
| | | | | (Vol) | | | 0.616 | |
| | | | | Rated current | | 2 | | mA |
| 36 | BU | Pulse width modulated signal for buzzer (OUTPUT) | PWM Signal OUT | (Voh) | 345 | | 5275 | Hz |
| | | | | (Vol) | | | 0.616 | V |
| | | | | Rated current | | 4 | | mA |
| 37 | RXD2 | UART-IRDA: receive data | DIGIN | (Vih) | 1.96 | | 3.3 | V |
| | | | | (Vil) | -0.5 | | 0.84 | |
| 8 | TXD2 | UART-IRDA: transmit data | DIGOUT | (Voh) | 2.24 | | | V |
| | | | | (Vol) | | | 0.616 | |
| | | | | Rated current | | 4 | | mA |
| 38 | PWON | POWER ON pin | Power On input | (Vih) | 0.7*VBATBB | | | |
| | | | | (Vil) | | | 0.3*VBATBB | |
| 7 | ROW4 | Keyboard matrix 5*5 row access | Interrupt (Input) | (Vih) | 1.96 | | 3.3 | V |
| | | | | (Vil) | -0.5 | | 0.84 | |
| | | | | Rated current | | 1 | | mA |
| 39 | IO10 | GPIO :Input/Output 10 | DIGI/O | (Voh) | 2.24 | | | V |
| | | | | (Vol) | | | 0.616 | |
| | | | | Rated current | | 2 | | mA |
| 5 | GND | Ground | | | | | | |

## Operating Voltage/Current Characteristics

| Parameter | Description | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Supply Voltage range VBATRF | | 3.3 | 3.6 | 5.0 | V |
| Peak VBATRF Current | | | 1.8 | | A |
| Average VBATRF Current | | 230 | | 260 | mA |
| Average Standby mode VBATRF current | Paging Rate 9 | | 3 | | mA |
| Vih | High-level input voltage | 1.96 | | 3.3 | V |
| Vil | Low-level input voltage | -0.5 | | 0.84 | V |
| Voh | High-level output voltage | 2.24 | | | V |
| Vol | Low-level output voltage | | | 0.616 | V |
| SIM_CLK | Output frequency | 1.625 | | 3.25 | MHz |
| VRSIM | SIMSEL=1 | 2.7 | 2.85 | 3.0 | V |

## Audio Uplink Characteristics

| Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Maximum Input Range (MICIP-MICIN) | Inputs 3 dBm0 (Maximum digital sample amplitude with PGA gain set to 0 dB) | | 32.5 | | mVrms |
| Nominal Ref. Level (MCIP-MICIN) | | | -10 | | dBm0 |
| Differential Input Resistance | | | 36 | | KO |
| Micro amplifier gain (MIC) | | | 25.6 | | dB |
| Maximum Input Range (AUXI) | Input 3 dBm0 (Maximum digital sample amplitude with PGA gain set to 0dB) | | 365 | | mVrms |
| Nominal Ref. Level (AUXI) | | | -10 | | dBm0 |
| Micro amplifier gain (AUXI) | VBDFAUXG=0 | | 4.6 | | dB |
| | VBDFAUXG=1 | | 28.2 | | dB |
| Input Resistance at AUXI | VBDFAUXG=0 | 100 | 170 | 24.5 | KO |
| DC Level at MICBIAS | MICBIAS=0 | | 2.0 | | Volt |
| Current Capability at MICBIAS | | 0 | | 2 | mA |

*Note:*

*(1) MICIP/MICIN and AUXI inputs are multiplexed, only one is available at the same time interval.*

## Audio Downlink Characteristics

| Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Differential Minimum Resistive load at EARP-EARN | Output swing 3.9 Vpp | | 120 | | O |
| | Output swing 1.5 Vpp | | 33 | | O |
| Differential Maximum Resistive load at EARP-EARN | | | | 100 | pF |
| Common Mode Minimum Resistive load at EARP-EARN | | | 200 | | KO |
| Common Mode Maximum Resistive load at EARP-EARN | | | | 10 | pF |
| Differential Minimum output resistive load at AUXOP | | 1 | 1.2 | | KO |
| Differential Minimum capacitor load at AUXOP | | | | 100 | pF |
| Common Mode Minimum resistive load at AUXOP | | | 200 | | KO |
| Common Mode Maximum Capacitor load at AUXOP | | | | 10 | pF |

## Global Characteristics

| Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Maximum Output Swing | 5% distortion and 120O | 3.1 | 3.92 | | Vpp |
| EARP – EARN | 5% distortion and 33O | 1.2 | 1.5 | | Vpp |
| Earphone amplifier gain | | | 1 | | dB |
| Earphone amplifier state in power down | | | Hi-Z | | |
| Maximum Output swing at AUXOP | 5% distortion maximum, load = 1k O | 1.6 | 1.96 | | Vpp |
| Auxiliary amplifier gain (AUXO) | | | -5 | | dB |
| AUXO amplifier state in power down | | | Hi-Z | | |
| Power Supply Rejection | | | 40 | | dB |

### 3.6. Environmental

Operational temperature : -20 ~ +60 ℃

Functional temperature : -20 ~ +70 ℃

Storage temperature : -40 ~ +85 ℃

Humidity: 95%

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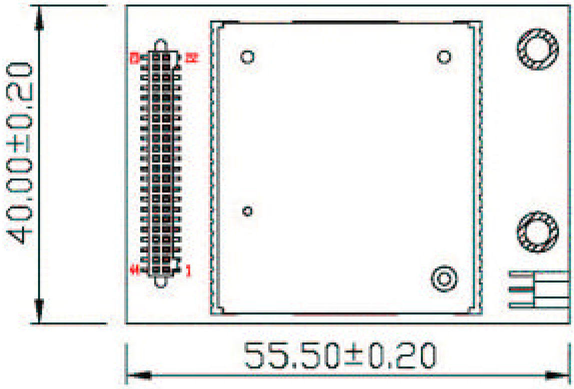
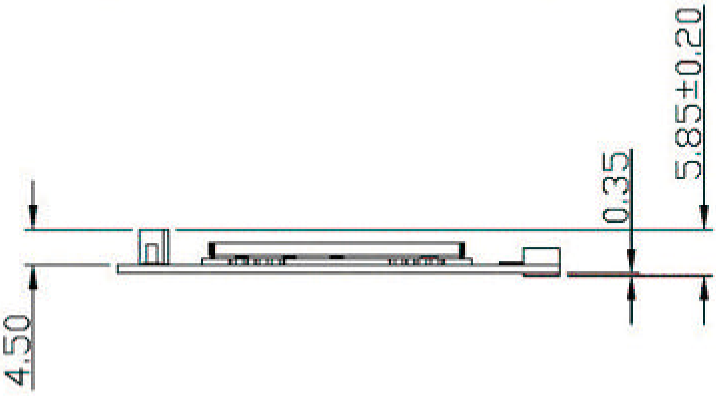
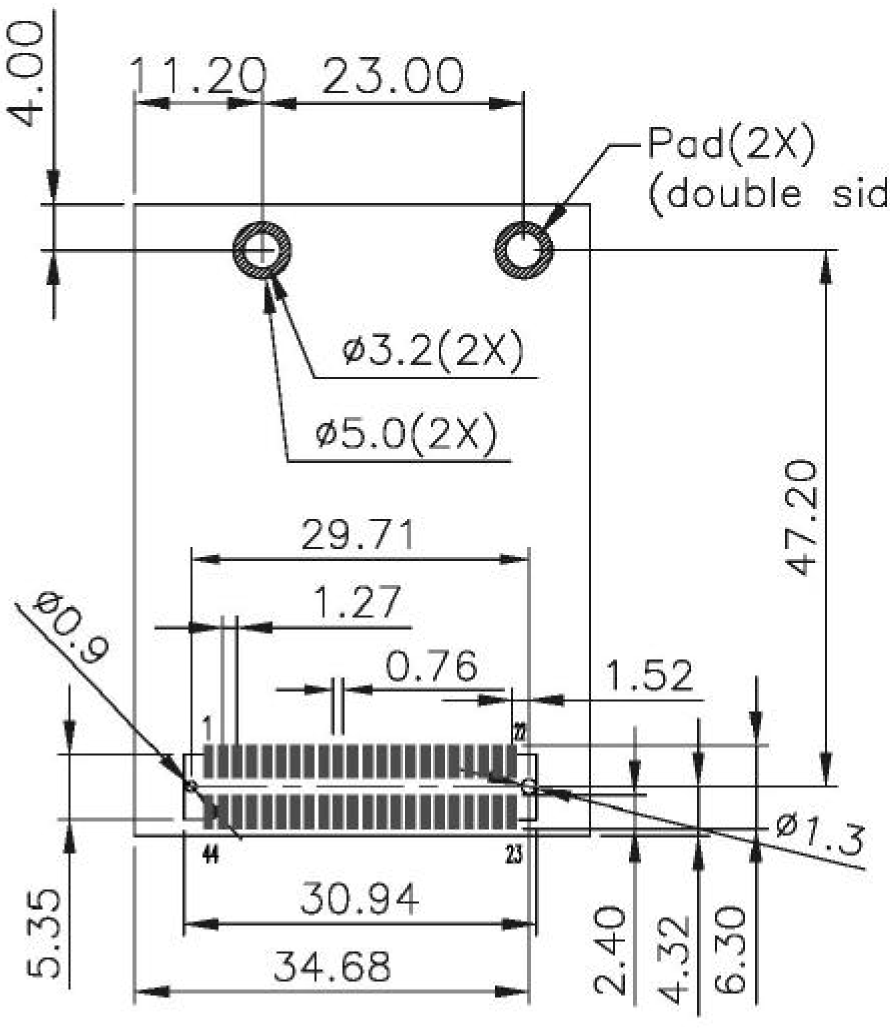
### 3.7. Physical Package

**Top View**






RECOMMENDED PCB LAYOUT

# 4. Software Characteristics

## 4.1. Introduction

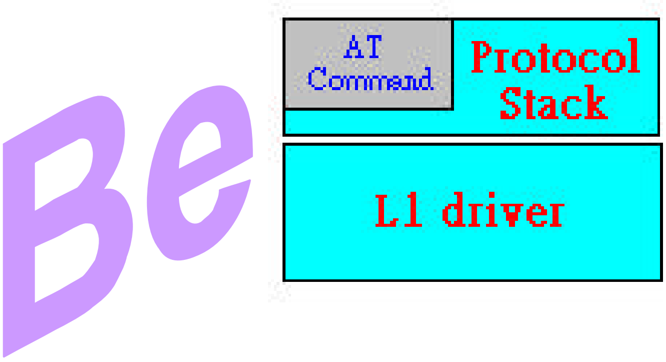
The following descriptions define the BenQ M22 module software architecture. For wireless PSTN customers, BenQ provides the supporting AT Commands. For telemetric application, the following is needed: Address book, PC sync, Grouping by Ring Tones, and FAX.

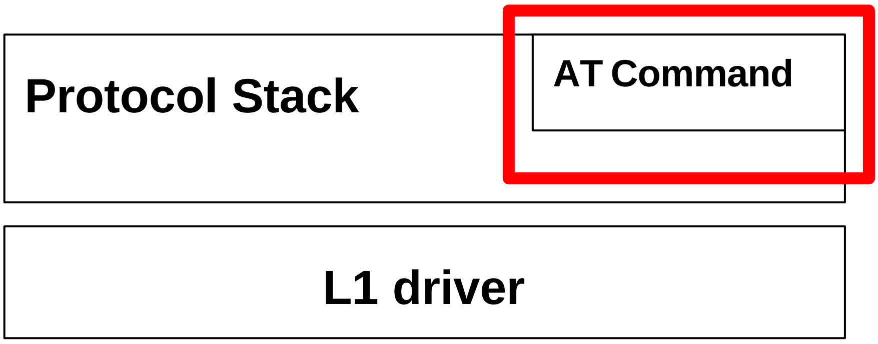
## 4.2. Software Architecture

BenQ provides the Layer 1 driver and AT command. Based on different customer needs, different software architectures will be supported. This will be defined in the next section.

<u>Architecture:</u>

- **Layer 1 Driver**
- **Protocol Stack/AT Command**
- **Basic interface**




## 4.3. Software Architecture of Wireless PSTN

Due to the fact that there are both processors in BenQ' s Module and the wireless PSTN, the common interface uses the AT Command. The software architecture was showed as the following diagram. Customers can use BenQ provided AT Commands to access the GSM/GPRS network on their platform.